

REMARKS

Claims 1, 13 and 17 are independent.

Claim 1 stands rejected under 35 U.S.C. § 102 as being anticipated by WO 99/33110 to Ding et al. (“Ding”), and claims 13 and 17 stand rejected under 35 U.S.C. § 103 as being unpatentable over Ding in view of Rathore et al. ‘068 (“Rathore”). These rejections are respectfully traversed for the following reasons.

As a preliminary matter, it is submitted that the Examiner has not identified where or how Ding allegedly discloses **non**-epitaxial growth as recited in the pending claims. In imposing a rejection under 35 U.S.C. §102, the Examiner is required to point to "page and line" wherein an applied reference is perceived to identically disclose each feature of a claimed invention. *In re Rijckaert*, 9 F.3d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993); *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 221 USPQ 481 (Fed. Cir. 1984).

Each of claims 1, 13 and 17 embody the step of forming a conductive film **having non epitaxial crystal structure** on a barrier film **having a crystal structure**. As described on page 9, line 23 – page 10, line 8 of Applicants’ specification, non epitaxial growth is different from epitaxial growth in that non epitaxial growth is performed at a lower temperature to form a film in an incomplete crystal state (a relatively amorphous film state) whereas epitaxial growth results in a hard crystal structure.

Ding, on the other hand, discloses forming a film **having crystallinity** on an **amorphous barrier layer** so as to directly **teach away** from the claimed invention (*see, e.g.*, page 7, lines 3-4 where Ding expressly describes depositing a copper layer having a high crystallographic content; *see also* page 13, lines 10-20 of Ding). Indeed, it is respectfully submitted that Ding is completely silent as to a step of depositing a low crystallinity seed layer on a barrier film having crystallinity.

As anticipation under 35 U.S.C. § 102 requires that each and every element of the claim be disclosed, either expressly or inherently (noting that "inherency may not be established by probabilities or possibilities", *Scaltech Inc. v. Retec/Tetra*, 178 F.3d 1378 (Fed. Cir. 1999)), in a single prior art reference, *Akzo N.V. v. U.S. Int'l Trade Commission*, 808 F.2d 1471 (Fed. Cir. 1986), based on the forgoing, it is submitted that Ding does not anticipate claim 1, nor any claim dependent thereon.

As described on page 3, lines 18-20 of Applicants' specification, one of the objects of the present invention is to improve wiring reliability and increase production yields of a semiconductor device by preventing defects (e.g., voids within the wiring) due to stress migration. According to one exemplary embodiment of the present invention, a seed layer having substantially no crystallinity can be formed on a barrier film having crystallinity, and thereafter a plated film for forming the wiring can be deposited on the seed layer and both can be crystallized by annealing. As a result, the present invention can enable the crystallinity of the seed layer to match the crystallinity of the barrier film therebelow, and the crystallinity of the plated film to match the crystallinity of the seed layer as the crystallization progresses. The present invention can therefore enable the adhesions between the barrier film and seed layer as well as between the seed layer and plated film to be improved by a small crystallization energy (see, e.g., page 10, lines 15-25 of Applicants' specification). Only Applicants have recognized and considered such a **combination** of using non epitaxial crystal formed on a film having a crystal structure.

Regarding claims 13 and 17, similarly to claim 1, the Examiner relies on Ding as allegedly disclosing the non epitaxial growth step. The Examiner relies on the additional cited prior art (i.e., Kishida et al., Rathore, Ding et al. '926) as allegedly disclosing other features of the present invention and NOT for disclosing the non epitaxial growth step. Indeed, it is submitted that none of Kishida et al., Rathore, nor Ding et al. '926 appear to disclose or suggest a non epitaxial growth step.

In fact, similarly to Ding, Ding et al. '926 *teaches away* from the claimed invention in that the disclosed method forms a film having crystallinity on an amorphous barrier layer (*see* col. 7, lines 47-55 of Ding et al. '926). Accordingly, even assuming *arguendo* proper, the proposed combinations do not disclose or suggest the claimed inventions.

The Examiner is directed to MPEP § 2143.03 under the section entitled "All Claim Limitations Must Be Taught or Suggested", which sets forth the applicable standard:

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. (citing *In re Royka*, 180 USPQ 580 (CCPA 1974)).

In the instant case, the pending rejections do not "establish *prima facie* obviousness of [the] claimed inventions" as recited in claims 13 and 17 because the proposed combinations fail the "all the claim limitations" standard required under § 103.

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as claims 1, 13 and 17 are patentable for the reasons set forth above, it is respectfully submitted that all claims dependent thereon are also patentable. In addition, it is respectfully submitted that the dependent claims are patentable based on their own merits by adding novel and non-obvious features to the combination.

For example, with respect to claim 8, as Ding and Kishida are directed to opposing processes for depositing Cu films in that Ding discloses depositing Cu film on a barrier film *with no crystallinity* whereas Kishida discloses depositing Cu film on a barrier film *having crystallinity*. For at least this reason and absent hindsight reasoning using Applicants' specification, there is no

motivation or rationale, derived solely from the prior art, to combine the teachings of such conflicting processes.

Based on the foregoing, it is submitted that all pending claims are patentable over the cited prior art. Accordingly, it is respectfully requested that the rejections under 35 U.S.C. § 102 and 103 be withdrawn.

CONCLUSION

Having fully and completely responded to the Office Action, Applicants submit that all of the claims are now in condition for allowance, an indication of which is respectfully solicited. If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, the Examiner is requested to call Applicants' attorney at the telephone number shown below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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